

## Entrance Exam for MSc Biochemistry

All applicants that meet the requirements for MSc Biochemistry must take the entrance exam. To pass the exam applicants must answer **at least half of the questions** correctly.

### The Exam structure:

- **60 multiple choice questions** with one or more correct answers.
- Up to **90 minutes** to complete the test.
- The test is held **online** (all the instructions will be provided to the applicants personally).
- All applicants take the test at the same time once a year (it is normally taking place in June). The exact date for each year admission is announced in May.

**The syllabus** for the exam is based on all topics found in a book by **Lehninger “Principles of Biochemistry”**. An overview of the topics is displayed bellow.

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| Introduction. Historic premises. Molecular composition and raise of cells. Genetic code up to <i>Homo sapiens</i> .  |
| Nucleic acids. Structure and functions. Mutability factors. Gene engineering enzymes, PCR. DNA sequencing and genomics. Foundation of RNA functions. Transcriptomics.  |
| Proteins. Protein structure, folding and stability. Turnover of proteins in a cell. Proteomics: premises, methods, outcome.  |
| Protein functions. Hemoglobin case study. Enzymes as biocatalysts: general concepts, thermodynamics and kinetics. Michaelis-Menten model of enzyme kinetics. The active site of enzyme, specificity, coenzymes. Types of enzyme catalysis. Enzyme inhibition and regulation of activity in a cell. |
| Carbohydrates. Structure and biological functions. Glycoproteins, proteoglycans, peptidoglycans – structure and biological functions.  |
| Lipids. Structure and functions. Lipid polymorphism, phase transition temperature. The composition of biological membranes. Membrane structures.   |
| Solute transport across membrane. Channels, mechanism of action. Active transport, ATPases and ABC transporters.   |
| General metabolism scheme. Glycolysis. Regulation of carbohydrate metabolic pathways.  |
| Fatty acid catabolism. Oxidation of fatty acids. Ketone bodies.  |
| Protein catabolism. Pathways of amino acid degradation. Production of urea.  |
| The citric acid cycle. Glyoxylate cycle.   |
| Oxidative phosphorylation.   |
| Photosynthesis. Calvin cycle.  |
| Biosynthesis of carbohydrates.   |
| Biosynthesis of lipids.  |
| Biosynthesis of amino acids and biologically relevant peptides.  |
| Metabolism of nucleic acids.   |

